Atomic Foundations of Matter

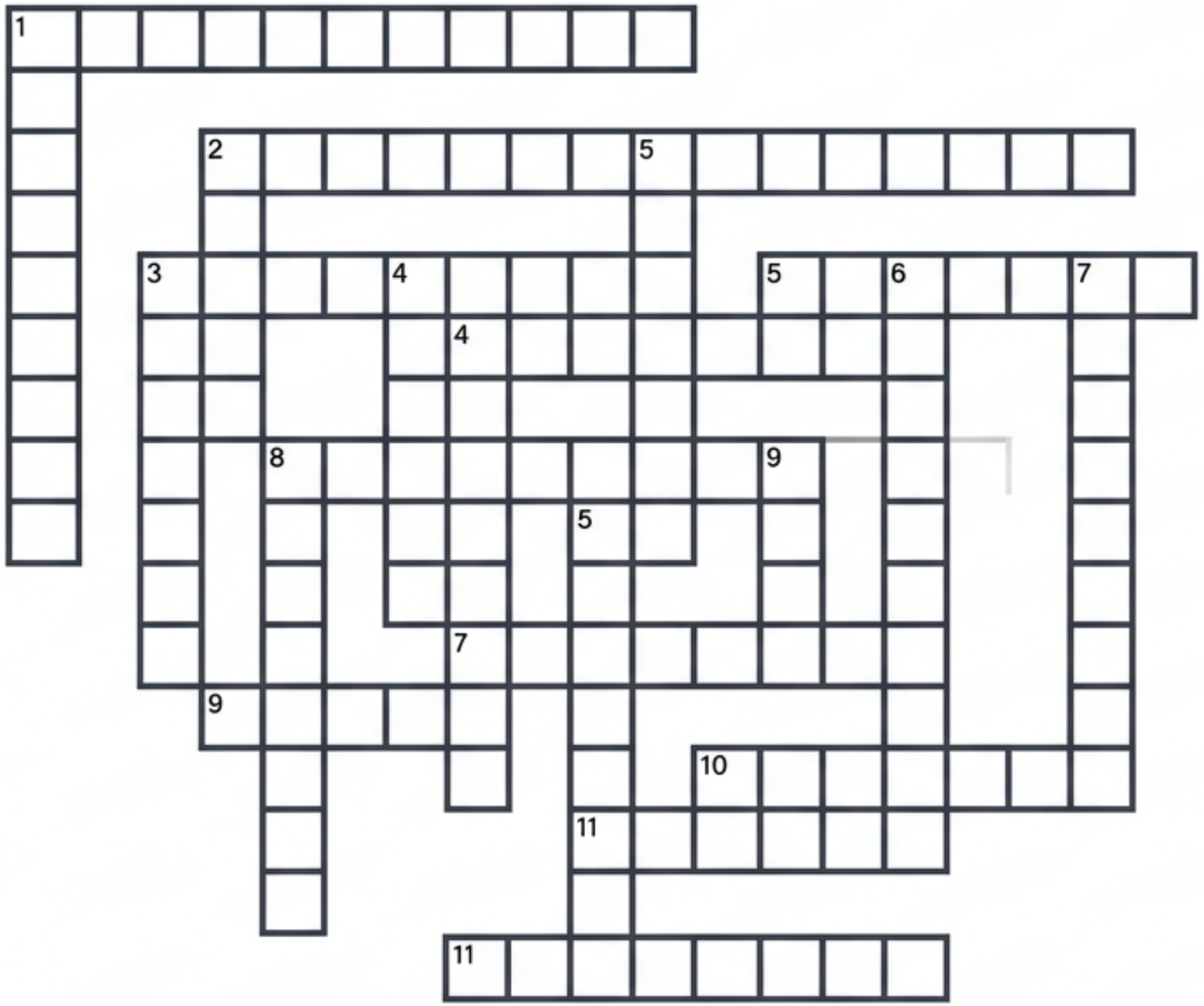
Chapter 9 Interactive Puzzle Workbook

Smart Board Ready: Grab a stylus. Collaborate. No answer keys ahead.

NotebookLM

Puzzle 1 · The Crossword (Solo or pairs, 15 min)

Every answer is a word from this chapter. Fill the white squares — one letter per square.



ACROSS

2. the smallest indivisible particle of an element, per Dalton (4)
4. the smallest particle of an element or compound that exists independently (8)
6. Law of ____ of Mass — mass is neither created nor destroyed (12)
7. a positively charged ion (6)
8. chemical ____ — shorthand showing a compound's composition (7)
11. surname of the scientist behind the Law of Constant Proportions (6)

DOWN

1. the combining capacity of an element (7)
3. ____ bond — formed by sharing of electrons (8)
5. the ____ method for writing chemical formulas (10)
9. a negatively charged ion (5)
10. ____ bond — formed by transfer of electrons (5)

NotebookLM

Puzzle 2 · Word Search (Solo — race the clock, 10 min)

16 terms are hiding in the grid — across, down, diagonally, and backwards. Circle each one, then tick it off the list.

D	R	B	T	K	Y	T	P	Q	G	Y	M	O	T	A
B	W	A	J	E	L	U	C	E	L	O	M	A	S	R
T	O	Q	K	U	I	R	D	N	U	O	P	M	O	C
F	K	N	U	M	E	G	J	Z	C	I	N	O	I	K
Q	R	Y	D	N	X	C	O	V	A	L	E	N	T	Y
E	U	T	Q	B	C	H	A	R	G	E	U	Y	C	W
C	A	T	I	O	N	U	H	B	L	X	G	N	S	G
T	E	N	A	V	E	R	A	H	S	I	E	L	Z	S
S	F	O	R	M	U	L	A	G	H	L	L	P	A	Q
U	L	I	S	E	C	U	T	N	A	D	J	R	H	N
O	J	N	M	U	O	O	K	V	T	G	A	G	O	F
R	Q	A	G	A	W	Y	Z	N	E	I	R	T	P	H
P	D	U	O	F	S	V	B	A	K	O	L	T	A	D
R	M	M	D	K	A	S	Q	V	J	A	Z	D	V	F
E	L	E	M	E	N	T	A	F	D	M	W	I	B	J

- ☐ Covalent
- ☐ Molecule
- ☐ Compound
- ☐ Valency
- ☐ Formula
- ☐ Element
- ☐ Cation
- ☐ Dalton
- ☐ Proust
- ☐ Proust
- ☐ Charge
- ☐ Ionic
- ☐ Anion
- ☐ Share
- ☐ Atom
- ☐ Mass
- ☐ Bond

Race Rules: Solo (find all words), Pairs (divide directions), Hard mode (cover list), Champion move (state meaning out loud).

NotebookLM

Puzzle 3 · Scrambled Terms (Solo, 8 min)

Every row is a chapter word with its letters shuffled. Unscramble it. The clue in brackets is your lifeline — try to solve without it first.

1. O S S C S I C R S R _____

(the method used to write chemical formulas from valency)

2. I C O A T O E N N S R V _____

(Law of ____ of Mass)

3. N R P O T O R P O I _____

(Law of Constant ____ — fixed ratio by mass)

4. I I D B I S L V I N E _____

(Dalton believed atoms were this)

5. M A C L E R O U L _____

(____ mass — sum of atomic masses in a molecule)

6. C L T A E O V N _____

(bond formed by sharing electrons)

7. C T O N E R E L _____

(the particle transferred or shared in bonding)

8. N D O P O U M C _____

(a substance made of two or more elements chemically joined)

NotebookLM

Puzzle 4 · Odd One Out (Teams of 4, 10 min)

Three belong together. One does not. Circle the odd one — then write why. The ‘why’ is where the marks are.

Ionic bond · Covalent bond
Valency · Petrichor

Because...

Cation · Anion · Molecule ·
Ion (charge-carrying particles)

Because...

Dalton · Proust
Lavoisier · Tyndall

Because...

Atom · Molecule · Compound
Displacement

Because...

Sodium chloride · Water
Oxygen gas · Carbon dioxide
(compounds vs elements)

Because...

Formula · Valency
Criss-cross method · Fulcrum

Because...

NotebookLM

Puzzle 5 · Chapter Scrabble (Groups of 3–4, 20 min)

Build only terms from this chapter — no ordinary English words allowed.

A1 B3 C3 D2 E1 G2 H4 I1
L1 M3 N1 O1 P3 R1 S1
T1 U1 V4 V4 X8 Y4 Z10
Z10
Scoring Rules
Tile value
×2 for chapter term
+10 for 8+ letters
+5 for stating meaning
+3 for real-life example
−5 for successful challenge

NotebookLM

Puzzle 6 · Who Am I? — Clue Cards (Whole class, 15 min)

One student reads only the first clue aloud; the class guesses. Wrong guess? Read clue 2. Fewer clues used = more points.

① **Combining capacity of an element**
② Sodium has 1, carbon has 4
③ **Valency**

.....

① **Forms when electrons are transferred**
② Holds sodium chloride together
③ **Ionic bond**

.....

① **Forms when electrons are shared**
② Holds water molecules together
③ **Covalent bond**

.....

① **Positively charged ion**
② Lost one or more electrons
③ **Cation**

.....

① **Negatively charged ion**
② Gained one or more electrons
③ **Anion**

.....

① **Atoms are indivisible/identical**
② First modern atomic theory
③ **John Dalton**

.....

① **Fixed proportion by mass**
② Law of Constant Propo-Constant Proportions
③ **Joseph Proust**

.....

① **Mass is neither created nor destroyed**
② Fundamental law of chemistry
③ Law of Conservation of Mass

.....

① **Shorthand for a compound's composition**
② H_2O is an example
③ **Chemical formula**

.....

① **Uses valency crossed between two elements**
② Makes writing formulas quick
③ **Criss-cross method**

.....

NotebookLM

Puzzle 7 · True or False Sprint (Whole class, standing, 6 min)

Teacher reads a statement. True → stay standing. False → sit down. Get it wrong and you are out.

1.	An ionic bond forms by sharing electrons.	[TRUE]	[FALSE]
2.	A covalent bond forms by sharing electrons.	[TRUE]	[FALSE]
3.	A cation is a negatively charged ion.	[TRUE]	[FALSE]
4.	An anion is a negatively charged ion.	[TRUE]	[FALSE]
5.	John Dalton proposed that atoms are indivisible.	[TRUE]	[FALSE]
6.	Joseph Proust's law states elements combine in a fixed proportion by mass.	[TRUE]	[FALSE]
7.	The Law of Conservation of Mass says mass can be created in a reaction.	[TRUE]	[FALSE]
8.	Valency is the combining capacity of an element.	[TRUE]	[FALSE]
9.	The criss-cross method helps write chemical formulas.	[TRUE]	[FALSE]
10.	A molecule of an element must always contain two different elements.	[TRUE]	[FALSE]
11.	Molecular mass is the sum of the atomic masses in a molecule.	[TRUE]	[FALSE]
12.	Water is an example of a compound.	[TRUE]	[FALSE]
13.	Oxygen gas (O_2) is a compound, not an element.	[TRUE]	[FALSE]
14.	Sodium chloride is held together by an ionic bond.	[TRUE]	[FALSE]

NotebookLM

Puzzle 8 · Bingo Word Bank (Whole class, 15 min)

Choose any 16 words to fill your physical grid. Wait for the caller’s meaning.

Valency	Ionic bond	Covalent bond	Cation	Anion	
Molecule	Dalton	Proust	Formula	Criss-cross method	
Conservation of mass	Atom	Molecular mass	Compound	Element	Charge

NotebookLM

Puzzle 9 · Two Truths and a Lie (Pairs, 10 min)

Set 1

(a) Ionic bonds involve transfer of electrons.
(b) Covalent bonds involve transfer of electrons.
(c) Covalent bonds involve sharing of electrons.

The lie is ____. Corrected: _____

Set 2

(a) A cation is positively charged.
(b) A cation has gained electrons.
(c) A cation has lost electrons.

The lie is ____. Corrected: _____

Set 3

(a) Dalton said atoms are indivisible.
(b) Dalton said atoms of different elements are identical.
(c) Proust discovered the Law of Constant Proportions.

The lie is ____. Corrected: _____

Set 4

(a) The Law of Conservation of Mass applies to chemical reactions.
(b) Mass can increase during a reaction.
(c) Mass is neither created nor destroyed in a reaction.

The lie is ____. Corrected: _____

NotebookLM

Puzzle 10 · The Escape Challenge (Teams of 4, 25 min)

Solve all five gates. Each gives you one digit. Collect all five to unlock the exit code.

Gate 1: The Bond Gate - How many main bond types are named (ionic, covalent)? Use that number.

Digit: [ ]

Gate 2: The Ion Gate - How many ion types are named (cation, anion)? Use that number.

Digit: [ ]

Gate 3: The Law Gate - How many laws of chemical combination are named (conservation of mass, constant proportions)? Use that number.

Digit: [ ]

Gate 4: The Formula Gate - Count the letters in ATOM.

Digit: [ ]

Gate 4: The Formula Gate - Count the letters in ATOM.

Digit: [ ]

Digit: [ ]

NotebookLM